

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously presented) A method for determining a face direction of a person's face captured in a digital image, the method comprising the steps of:

processing said digital image to determine a nose axis of said face in said digital image;

processing said digital image to compute digital data representing a rotation of said face in said digital image based on said determined nose axis of said face;

processing said digital image to compute digital data representing a tilt of said face in said digital image; and

determining a quantitative face direction of said face in said image based on said data representing the rotation of said face in said image and said data representing the tilt of said face in said image.

2. (Previously presented) The method according to claim 1, wherein the processing said digital image to determine the nose axis of said face in said digital image comprises determining said nose axis by maximizing a correlation measure between a left side and a right side of said face from left and right sub-images of said image.

3. (Previously presented) The method according to claim 2, wherein the processing said digital image to determine the nose axis of said face in said digital image comprises comparing one of said left and right sides with a synthetic side derived from the other of said left and right sides using symmetry and a perspective transformation of said other side to compute said correlation measure.

4. (Previously presented) The method according to claim 3, wherein the processing said digital image to determine further comprises applying a contrast enhancement algorithm to a nose region of said image, wherein said nose in the part of a face that reflects the most light, said reflected light being represented as a line-like region close to a real nose axis.

5. (Previously presented) An apparatus for determining a face direction of a person's face captured in a digital image, the apparatus comprising:

means for processing said digital image to determine a nose axis of said face in said digital image;

means for processing said digital image to compute digital data representing a rotation of said face in said digital image based on said determined nose axis of said face;

means for processing said digital image to compute digital data representing a tilt of said face in said digital image; and

means for determining a quantitative face direction of said face in said image based on said data representing the rotation of said face in said image and said data representing the tilt of said face in said image.

6. (Previously presented) The apparatus according to claim 5, wherein said means for processing said digital image to determine the nose axis of said face in said digital image determines said nose axis by maximizing a correlation measure between a left side and a right side of said face from left and right sub-images of said image.

7. (Previously presented) The apparatus according to claim 6, wherein said means for processing said digital image to determine the nose axis of said face in said digital image compares one of said left and right sides with a synthetic side derived from the other of said left and right sides using symmetry and a perspective transformation of said other side to compute said correlation measure.

8. (Previously presented) The apparatus of claim 7, wherein said means for processing said digital image to determine the nose axis of said face in said digital image applies a contrast enhancement algorithm to a nose region of said image, wherein said nose in the part of a face that reflects the most light, said reflected light being represented as a line-like region close to a real nose axis.

9. (Currently amended) A computer readable medium that stores a computer program product for determining a face direction of a person's face captured in a digital image, the computer program product comprising:

computer readable program code means for processing said digital image to
determine a nose axis of said face in said digital image;

computer readable program code means for processing said digital image to
compute digital data representing a rotation of said face in said digital
image based on said determined nose axis of said face;

computer readable program code means for processing said digital image to
compute digital data representing a tilt of said face in said digital image;
and

computer readable program code means for determining said quantitative face
direction of said face in said image based on said data representing the
rotation of said face in said image and said data representing the tilt of
said face in said image.

10. (Currently amended) The computer readable medium program—product according to claim 9, wherein said computer readable program code means for processing said digital image to determine a nose axis of said face in said digital image maximizes a correlation measure between a left side and a right side of said face from left and right sub-images of said image.

11. (Currently amended) The computer readable medium program—product according to claim 10, wherein said computer readable program code means for

processing said digital image to determine a nose axis of said face in said digital image compares one of said left and right sides with a synthetic side derived from the other of said left and right sides using symmetry and a perspective transformation of said other side to compute said correlation measure.

12.-46. (Cancelled)

47. (Previously presented) The method of claim 1, further comprising generating a plurality of quantitative face directions, wherein said generating the plurality of quantitative face directions comprises:

- obtaining a plurality of digital images of said face; and

- for each of said plurality of digital images:

- processing said each digital image to determine a nose axis of said face in said digital image

- processing said each digital image to compute digital data representing a rotation of said face in said digital image based on said determined nose axis of said face in said each image;

- processing said each digital image to compute digital data representing a tilt of said face in said each digital image; and

- determining a quantitative face direction of the face in said each digital image based on said data representing the rotation of said face in said each image and said data representing the tilt of said face in said each image;

whereby a plurality of quantitative face directions is obtained .

48. (Previously presented) The method of claim 1 further comprising providing a visual mouse to detect said quantitative face direction as an interface for a computer application.

49. (Previously presented) The method of claim 1 further comprising providing said quantitative face direction as input to a computer application to provide eye-to-eye contact communication in video-conferencing.

50. (Cancelled)

51. (Previously presented) The apparatus of claim 5, further comprising means for obtaining a plurality of digital images of said face; and wherein, for each of said plurality of digital images,

said means for processing said each digital image to determine a nose axis of said face in said each digital image determines the nose direction of said face in said each digital image;

said means for processing said each digital image to compute digital data representing a rotation of said face in said each digital image based on said determined nose axis of said face computes said digital data representing a rotation of said face in said each digital image based on said determined nose axis of said face in said each image;

said means for processing said each digital image to compute digital data representing a tilt of said face in said each digital image computes said digital data representing said tilt of said face in said each digital image; and

said means for determining a quantitative face direction of said face in said each digital image based on said data representing the rotation of said face in said each image and said data representing the tilt of said face in said each image determines said quantitative face direction of said face in said each digital image based on said data representing the rotation of said face in said each image and said data representing the tilt of said face in said each image;

whereby a plurality of quantitative face directions is obtained .

52. (Previously presented) The apparatus of claim 5 further comprising means for providing a visual mouse to detect the quantitative face direction as an interface for a computer application.

53. (Previously presented) The apparatus of claim 5 further comprising means for providing said face direction as input to a computer application to provide eye-to-eye contact communication in video-conferencing.

54. (Cancelled)

55. (Currently amended) The computer readable medium ~~product~~ means of claim 9, further comprising

computer readable program code means for obtaining a plurality of digital images of said face;

wherein, for each of said plurality of digital images,

said computer readable program code means for processing said each digital image to determine a nose axis of said face in said each digital image determines the nose direction of said face in said each digital image;

said computer readable program code means for processing said each digital image to compute digital data representing a rotation of said face in said each digital image based on said determined nose axis of said face computes said digital data representing a rotation of said face in said each digital image based on said determined nose axis of said face in said each image;

said computer readable program code means for processing said each digital image to compute digital data representing a tilt of said face in said each digital image computes said digital data representing said tilt of said face in said each digital image ; and

said computer readable program code means for determining a quantitative face direction of the face in said each digital image based on said data representing the rotation of said face in said each image and said data representing the tilt of said face in said each image determines said quantitative face direction of said face in said each digital image based on said data representing the rotation of said face in said each image and said data representing the tilt of said face in said each image;

whereby a plurality of quantitative face directions is obtained.

56. (Currently amended) The computer readable medium program-product of claim 9 further comprising computer readable program code means for providing a visual mouse to detect the quantitative face direction as an interface for a computer application.

57. (Currently amended) The computer readable medium program-product of claim 9 further comprising computer readable program code means for providing said face direction as input to a computer application to provide eye-to-eye contact communication in video-conferencing.

58. (Previously presented) The method of claim 47, further comprising:
determining changes in face direction using said plurality of quantitative face directions;
applying labels to said changes; and
parsing a sequence of said labels to determine a facial gesture.

59. (Previously presented) The apparatus of claim 51, further comprising:
means for determining changes in face direction using said plurality of quantitative face directions;
means for applying labels to said changes; and

means for parsing a sequence of said labels to determine a facial gesture.

60. (Previously presented) The computer readable medium ~~program-product~~ of claim 55, further comprising:

computer readable program code means for determining face direction changes using said plurality of quantitative face directions;

computer readable program code means for applying labels to said changes; and

computer readable program code means for parsing a sequence of said labels to determine a facial gesture.